Patent Claims

1. A process for low-temperature fractionation of air in a distillation column system for nitrogen-oxygen separation (5, 6), comprising:

- introducing a first feed air stream (4) into the distillation column system for nitrogen-oxygen separation,
- pressurizing an oxygen-rich fraction (22) removed from the distillation column system for nitrogen-oxygen separation in liquid form (23) and introducing said oxygen-rich fraction (25) to a mixing column (26),
- introducing a heat transfer medium stream, in particular a second feed air stream (43, 343), into the lower region of the mixing column (26) and bringing said heat transfer medium stream into countercurrent contact with the oxygen-rich fraction (22, 25),
- removing a gaseous top product (260) from the upper region of the mixing column (26),
- introducing a liquid (38, 39, 40, 41) from the lower or middle region of the mixing column into the distillation column system for nitrogen-oxygen separation,
- introducing a krypton- and xenon-containing oxygen stream (44, 46, 47, 48) from the distillation column system for nitrogen-oxygen separation into a krypton-xenon enriching column (36),
- removing a krypton- and xenon-enriched fraction (51) from the krypton-xenon enriching column (36),
- introducing a gaseous top product (260) from the mixing column (26) into an additional column (27) and removing a krypton- and xenon-depleted top fraction (28) from the upper region of the additional column (27).

2. A process according to Claim 1, wherein a part (29, 30) of the krypton- and xenon-depleted top fraction (28) from the additional column (27) is removed as gaseous pressurized oxygen product.

3. A process according to Claim 1, wherein a part (31) of the krypton- and xenon-depleted top fraction (28) from the additional column (27) is condensed in a condenser-evaporator (32).

4. A process according to Claim 2, wherein a part (31) of the krypton- and xenon-depleted top fraction (28) from the additional column (27) is condensed in a condenser-evaporator (32).

5. A process according to Claim 2, wherein a part (34) of condensate (33) generated in a condenser-evaporator (32) is added as reflux to said additional column (27).

6. A process according to Claim 3, wherein a part (34) of condensate (33) generated in said condenser-evaporator (32) is added as reflux to said additional column (27).

7. A process according to Claim 2, wherein a part (35) of condensate (33) generated in a condenser-evaporator (32) is added as reflux to the krypton-xenon enriching column.

8. A process according to Claim 5, wherein a part (35) of condensate (33) generated in said condenser-evaporator (32) is added as reflux to the krypton-xenon enriching column.

9. A process according to Claim 6, wherein a part (35) of condensate (33) generated in said condenser-evaporator (32) is added as reflux to the krypton-xenon enriching column.

10. A process according to Claim 2, wherein a liquid from the lower region of the krypton-xenon enriching column (36) is evaporated in a condenser-evaporator (32).

11. A process according to Claim 3, wherein a liquid from the lower region of the krypton-xenon enriching column (36) is evaporated in a condenser-evaporator (32).

12. A process according to any one of Claims 1 to 11, wherein said oxygen-rich fraction (22) is removed one to five theoretical plates above the bottom of the distillation column system for nitrogen-oxygen separation or is removed one to five theoretical plates above the bottom of one of the columns of the distillation column system for nitrogen-oxygen separation.

13. A process according to any one of Claims 1 to 11, wherein said oxygen-rich fraction (22) is removed one to five theoretical plates above the bottom of a low-pressure column (6) of the distillation column system which contains a two-column system, and said two-column system comprises said low-pressure column (6) and a high-pressure column (5).

14. A process according to any one of Claims 1 to 11, wherein the krypton- and xenon-containing oxygen stream (44) is removed from the bottom of the columns of the distillation column system for nitrogen-oxygen separation or is removed from the bottom of one of the columns of the distillation column system for nitrogen-oxygen separation.

15. A process according to Claim 12, wherein the krypton- and xenon-containing oxygen stream (44) is removed from the bottom of the columns of the distillation column system for nitrogen-oxygen

separation or is removed from the bottom of one of the columns of the distillation column system for nitrogen-oxygen separation.

16. A process according to Claim 13, wherein the krypton- and xenon-containing oxygen stream (44) is removed from the bottom of the columns of the distillation column system for nitrogen-oxygen separation or is removed from the bottom of one of the columns of the distillation column system for nitrogen-oxygen separation.

17. A process according to Claim 14, wherein the krypton- and xenon-containing oxygen stream (44) is removed from the bottom of a low-pressure column (6) of the distillation column system which contains a two-column system, and said two-column system comprises said low-pressure column (6) and a high-pressure column (5).

18. A process according to Claim 15, wherein the krypton- and xenon-containing oxygen stream (44) is removed from the bottom of a low-pressure column (6) of the distillation column system which contains a two-column system, and said two-column system comprises said low-pressure column (6) and a high-pressure column (5).

19. A process according to Claim 16, wherein the krypton- and xenon-containing oxygen stream (44) is removed from the bottom of a low-pressure column (6) of the distillation column system which contains a two-column system, and said two-column system comprises said low-pressure column (6) and a high-pressure column (5).

20. An apparatus for the low-temperature fractionation of air, comprising:

- a distillation column system for nitrogen-oxygen separation (5, 6), having a mixing column (26);
- a first feed air line (4) connected to the distillation column system for nitrogen-oxygen separation;
- a first liquid oxygen line (22, 25) connected to the distillation column system for nitrogen-oxygen separation and leading into the mixing column (26) via means (23) for increasing the pressure of the liquid;
- a heat transfer medium line connected to the lower region of the mixing column (26);
- means for removing a gaseous top product (260) from the upper region of the mixing column (26),
- a liquid line (38, 39, 40, 41) connected to the lower or middle region of the mixing column;
- a krypton-xenon enriching column (36) for obtaining a krypton- and xenon-enriched fraction (51),
- a second liquid oxygen line (44, 46, 47, 48) for introducing a krypton- and xenon-containing oxygen stream from the distillation column system for nitrogen-oxygen separation into the krypton-xenon enriching column (36),
- means (260) for introducing the gaseous top product from the mixing column (26) into an additional column (27); and
- means for removing a krypton- and xenon-depleted top fraction (28) from the upper region of the krypton-xenon enriching column (36).

21. An apparatus according to claim 20, wherein said heat transfer medium line is a second feed air line (43, 343) connected to the lower region of the mixing column (26),